Water Quality

Photo by Richard Fields, Indiana Department of Natural Resources.

Oh! the old swimmin'-hole! whare the crick so still and deep
Looked like a baby-river that was laying half asleep,
And the gurgle of the worter round the drift jest below
Sounded like the laugh of something we onc't ust to know
Before we could remember anything but the eyes
Of the angels lookin' out as we left Paradise;
But the merry days of youth is beyond our controle,
And it's hard to part ferever with the old swimmin'-hole.

"The Old Swimmin'-hole"

James Whitcomb Riley (1849-1916)

Ground water-Water found below the surface where holes, cracks and spaces between rocks and soil are filled with water.

Surface water-Natural and artificial accumulations of water on the land surface.

WATER POLLUTION

Water sustains life, supports commerce and agriculture, and provides recreation and enjoyment. We depend on surface and ground water for our drinking water. Indiana's beaches, rivers and lakes are popular destinations for recreation. Industry and commerce rely on Indiana's plentiful water supply to make steel, electricity and many other products.

Every time it rains or the snow melts, water carries pollutants from the air and land into surface and ground water. Some pollutants break down in the environment, but others persist and accumulate in fish, shellfish and other aquatic organisms or become trapped in river and lake beds for many years.

Water pollution sources are classified as point or nonpoint sources. Point sources of pollution have a known discharge point, such as a pipe or sewer. An example of a point source discharger is an industrial wastewater treatment plant that discharges treated water directly into a stream.

Nonpoint source pollution refers to water pollution that results from things such as soil erosion, agriculture, urban runoff, land development and air pollution deposits. Nonpoint pollution sources are often challenging to identify, measure and control.

Indiana's most harmful water pollutants

- Pathogens such as *E. coli*
- Oxygen-depleting nutrients such as fertilizers, untreated sewage and manure
- Chemical contaminants such as polychlorinated biphenyls, pesticides and metals
- Siltation from soil erosion

Typical contamination sources

Point sources

- Municipal sewage treatment
- Combined sewer overflows
- Industrial wastewater
- Electrical power plants

Nonpoint sources

- Agricultural activities
- Urban stormwater runoff
- Resource extraction
- Construction activities
- Land disposal (landfills and land application of sewage sludge)

DRINKING WATER

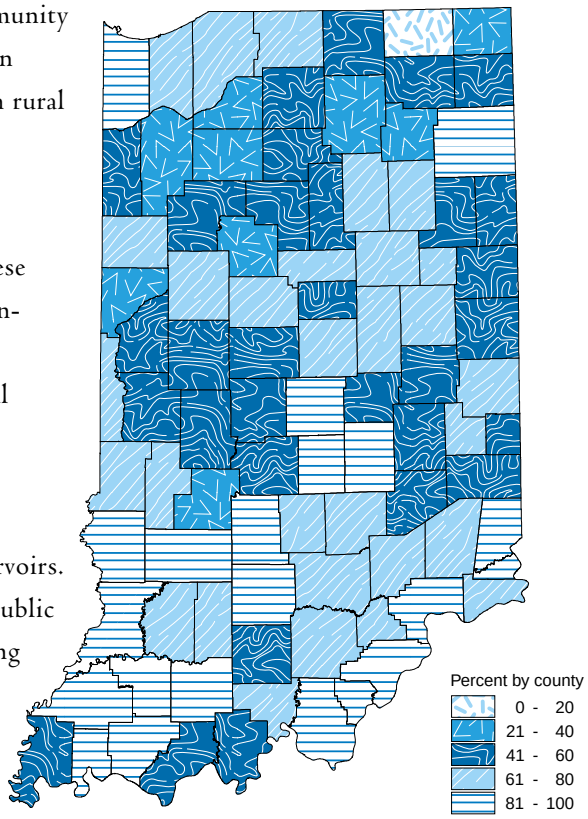
Seventy-two percent of Hoosiers get their drinking water from community public water supply systems. As might be expected, Hoosiers living in urban areas are more likely to use public drinking water than those in rural areas who are more likely to use private wells.

Public drinking water systems in Indiana

Indiana has more than 4,000 active public water supply systems. These range from large community systems serving urban areas to small non-community water systems serving seasonal campgrounds. More than 1,500 public drinking water systems serve residential and commercial customers year-round.

Indiana's public water systems obtain their water from ground water sources via wells or surface water sources such as lakes, rivers or reservoirs. Thirty-four percent of Indiana households obtain their water from public water systems that utilize ground water. Public water systems utilizing surface water serve an additional 38 percent of Hoosiers. Twenty-eight percent of Indiana households rely on private wells for drinking water.

Households served by public drinking water supply systems



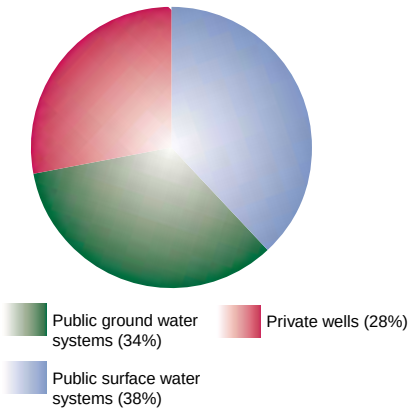
Public Water Systems

Public water systems are classified according to the number of people they serve, the source of their water (surface or groundwater), and whether they serve the same customers year-round or on an occasional basis:

Community Water Systems — Public water systems that supply water to the same population year-round.

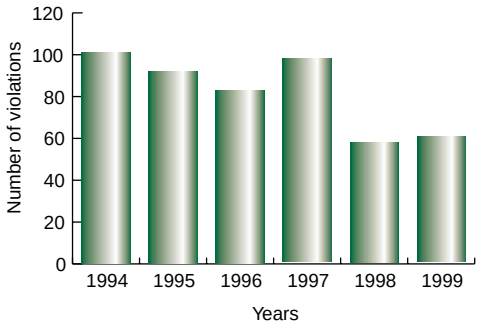
Non-Community Water Systems — Non-transient, non-community public water systems regularly supply water to at least 25 of the same people at least six months per year, but not year-round. Some examples are schools, factories, office buildings, and churches that have their own water systems. Transient non-community public water systems provide water in a place such as a gas station or campground where people do not remain for long periods of time.

Sources of drinking water for Indiana households



Map and chart source: IDEM Office of Water Management, 1999

Drinking water health standard violations
Community public water supply systems



Population served by systems in significant noncompliance

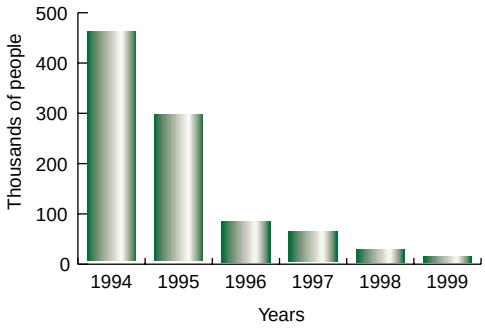


Chart and graphs source: IDEM Office of Water Management, 1998

Threats to drinking water

Contaminants can enter drinking water supplies from point sources or from nonpoint sources. These contaminants can move from the land into ground water or into lakes and streams. Community public water suppliers must properly treat and disinfect water, which may contain bacteria and nitrates. These contaminants pose the most immediate health risks.

Violations of drinking water standards

EPA has established drinking water health standards for 77 contaminants. If a public water system exceeds a standard, fails to properly treat the water or does not test according to schedule, the water supplier must notify its customers of the violation and work to correct the problem.

In 1999, 93 percent of community public water systems met all drinking water health standards for the 77 contaminants. Total coliform bacteria was the most common contaminant found in the noncompliant systems. Eighty-five percent of the systems that violated drinking water standards in 1999 violated the total coliform bacteria standard.

In addition to drinking water health standards violations, EPA and IDEM evaluate all public water systems based on compliance with all drinking water regulations, including monitoring and reporting requirements. Systems with multiple health or paperwork violations may be classified as being in significant noncompliance. The Indiana population served by systems in significant noncompliance has dropped 97 percent since 1994, to less than 13,500 people in 1999.

Consumer Confidence Reports

In 1999 community water systems were required to send their first Consumer Confidence Report to each customer. These reports provide important information to consumers about the characteristics of their water system and quality of water provided at the tap. These annual reports must be delivered to consumers each year by July 1. Consumer confidence reports for many Indiana communities are available at the EPA Office of Ground Water and Drinking Water website: *www.epa.gov/dwinfo/in.htm*

GROUND WATER

Ground water is the water found below the surface where holes, cracks and spaces between rocks and soil are filled with water. Thirty-four percent of the population served by public drinking water systems depend on ground water. In addition to public water systems, more than 500,000 Indiana homes use private wells and ground water systems for their water supply.

Ground water also supports Indiana's economy as a source of water for industrial and agricultural uses. In 1998, Indiana used approximately 250 billion gallons of ground water, 10 percent more than in 1986.

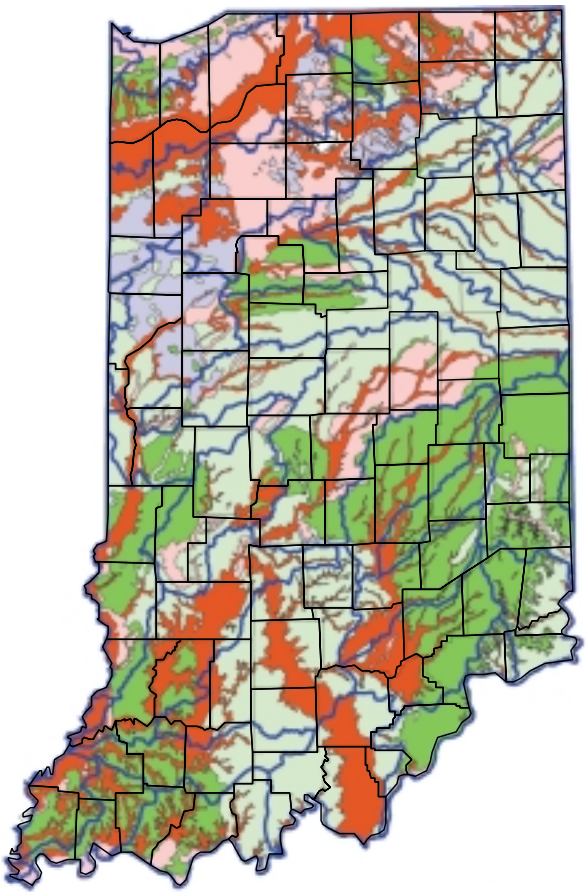
Ground water highly susceptible to contamination

Once contaminated, ground water is difficult to clean, requiring many years and great expense. Protecting ground water from possible pollution sources makes more sense.

Some ground water is more susceptible to contamination because of the kind of soils and rocks above it. In some cases, the ground water is so close to the surface that pollutants do not have far to travel. In other cases, soils above the ground water are porous and pollutants can move quickly. For example, the poorly drained soils found in much of Indiana make it difficult for septic systems to perform well, which may result in ground water contamination.

Ground water vulnerability indices, such as the map on this page, are valuable tools in source-water assessments for community public water supply systems. Ground water vulnerability indices help define the relationship between geology and ground water. They also provide a better understanding of the flow system between ground and water.

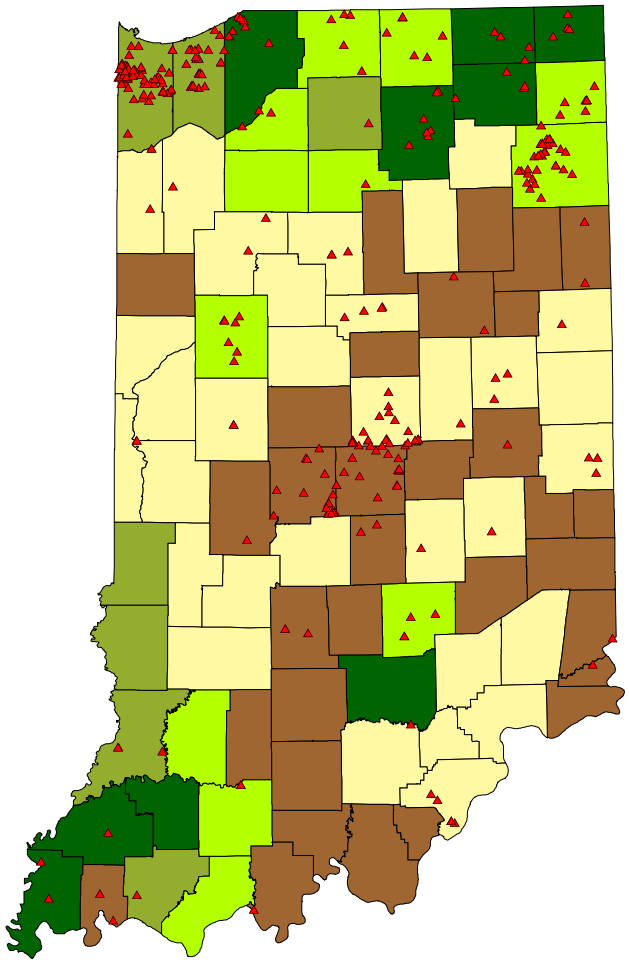
Ground water vulnerability based on geological conditions



This map is a work in progress of IDEM and the Indiana Geological Survey.

Source: Indiana Geological Survey, 1998

Indiana wetlands



Source: Indiana Water Quality Report (Acres of Wetland by County), 1998; Indiana Wetland Compensatory Mitigation: Inventory, 2000.

WETLANDS

Wetlands are areas of land that typically are flooded part of the year, have soils formed under wet conditions and support vegetation suited for life in saturated soil. Wetlands are important because they improve water quality, provide flood protection, shoreline erosion control and habitat for fish and wildlife. When European settlers arrived, Indiana had an estimated 5.6 million acres of wetlands. Since then, more than 85 percent of Indiana's wetland acreage has been drained and converted to farmland and urban areas.

Wetland mitigation

Wetland mitigation is the creation or restoration of a wetland to counter the loss of wetland acreage and function. In January 1998, IDEM and EPA initiated a series of studies to evaluate wetland regulation and mitigation, identify potential problems and formulate solutions. The first phase of this multi-year study identified construction status for 345 mitigation sites legally required between 1986 to 1996. During this time period, 214 mitigation sites had been constructed, 70 sites had been partially constructed, and no action had been taken on 49 sites. Steps are being taken to ensure that all required mitigation is occurring.

Importance of Wetlands

Wetlands serve as a valuable part of our natural environment. Wetlands interrupt and filter surface-water runoff, retaining excess nutrients and some pollutants, and reducing sediment that would clog waterways and affect aquatic life. Wetlands also provide flood protection, fish and wildlife habitat and protect against shoreline erosion.

SURFACE WATER QUALITY

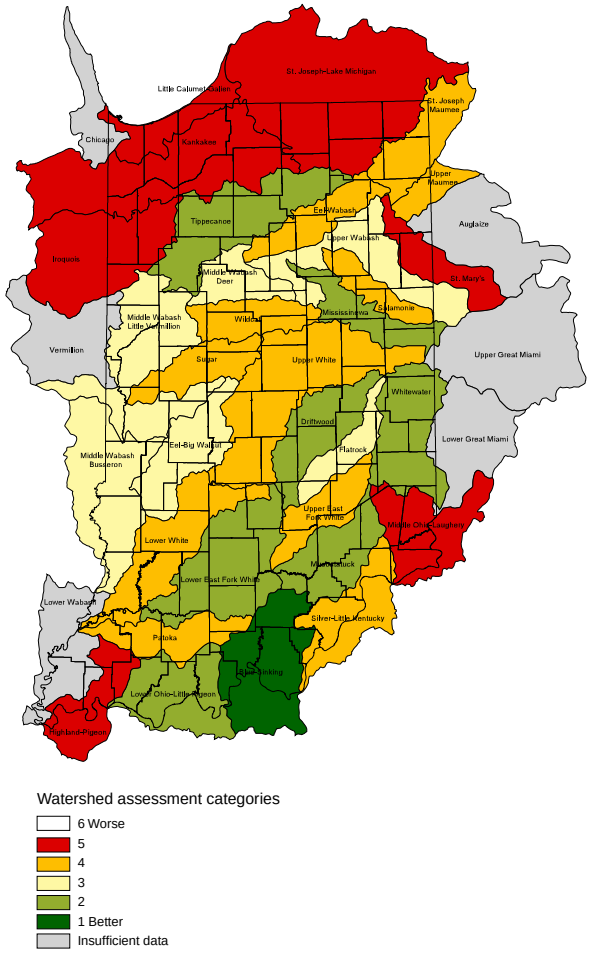
Focusing on watersheds allows environmental protection to move beyond political boundaries to more effectively understand and manage difficult issues. Such issues include sources of pollution, habitat destruction and drinking water protection. Indiana can be divided into 41 watersheds, many of which extend into neighboring states. These watersheds contain approximately 36,000 stream miles and drain into the state's nine major drainage basins. Also, more than 600 publicly owned inland lakes and reservoirs cover more than 106,000 acres within the basins. Surface water quality varies greatly, from severely degraded by pollution to clean enough for fishing, swimming or for use as a drinking water supply.

Surface water data used in this report

Indiana streams and lakes are monitored year-round and assessed every five years. IDEM's Surface Water Quality Monitoring Strategy is designed to provide technical data and information to identify impaired streams and lakes in Indiana. Section 305(b) of the Clean Water Act requires states to prepare and submit a water quality assessment report of state water resources every two years. The most recently published report is the 2000 *Indiana Water Quality Report,* submitted to EPA in March 2000.

In 1998, IDEM's Office of Water Management and the Natural Resources Conservation Service led the first Unified Watershed Assessment (UWA) of Indiana watersheds. The results of this assessment identify Indiana watersheds that do not meet Clean Water Act or other natural resource goals. Watersheds are rated on a scale of 1 to 6 (see map). The Unified Watershed Assessment was updated in 1999 to rate all Indiana watersheds as threatened.

Indiana watersheds



Source: IDEM Office of Water Management, 1999

Watershed
A land area that drains into a lake or river and its tributaries.

Basin
A large watershed or group of watersheds such as the Great Lakes and Ohio River basins.

For the purposes of this 2000 *State of the Environment Report*, basins within the state include groups of individual watersheds.

Guide to the assessment of the basins

Use this page as a general guide to the nine basin summaries that follow. The introduction on each page describes the basin's location and its main tributaries. In prior State of the Environment reports, watershed water quality was rated on a scale of 1 to 6, with 1 being better quality and 6 being worse quality. To compare this report to earlier reports, if 100 percent of surveyed stream miles supported all uses, it was rated one. If none of the surveyed stream miles supported all uses, it was rated six.

Major wastewater facilities

Each page shows the number and location of large facilities permitted to discharge to surface waters within the basin.

- Electrical-Large power plants that generate electricity and require water for cooling.
- ★ Government-Major state or federally owned sites such as correctional facilities and military bases.
- Industrial-Major industries with significant amounts of wastewater treatment discharge.
- ▲ Municipal-Major wastewater treatment plants that discharge more than 1 million gallons per day.

Basin maps show the location of watersheds as well as major cities and wastewater facilities.

OVERALL BASIN QUALITY

Aquatic life support

(% of total stream miles assessed for aquatic life support)

Provides suitable water quality for protection and reproduction of desirable aquatic life.

Does not provide suitable water quality for protection and reproduction of desirable aquatic life.

Recreational uses

(% of total stream miles assessed for recreational use)

People can swim in water without risk of adverse health effects, such as catching a waterborne disease from raw sewage contamination.

People swimming in water risk adverse health effects, such as catching a waterborne disease from raw sewage contamination.

Watersheds

		Aquatic life support			Recreational support		
Watershed	Stream miles	% Surveyed			% Surveyed		
Name	%	%		%	%		

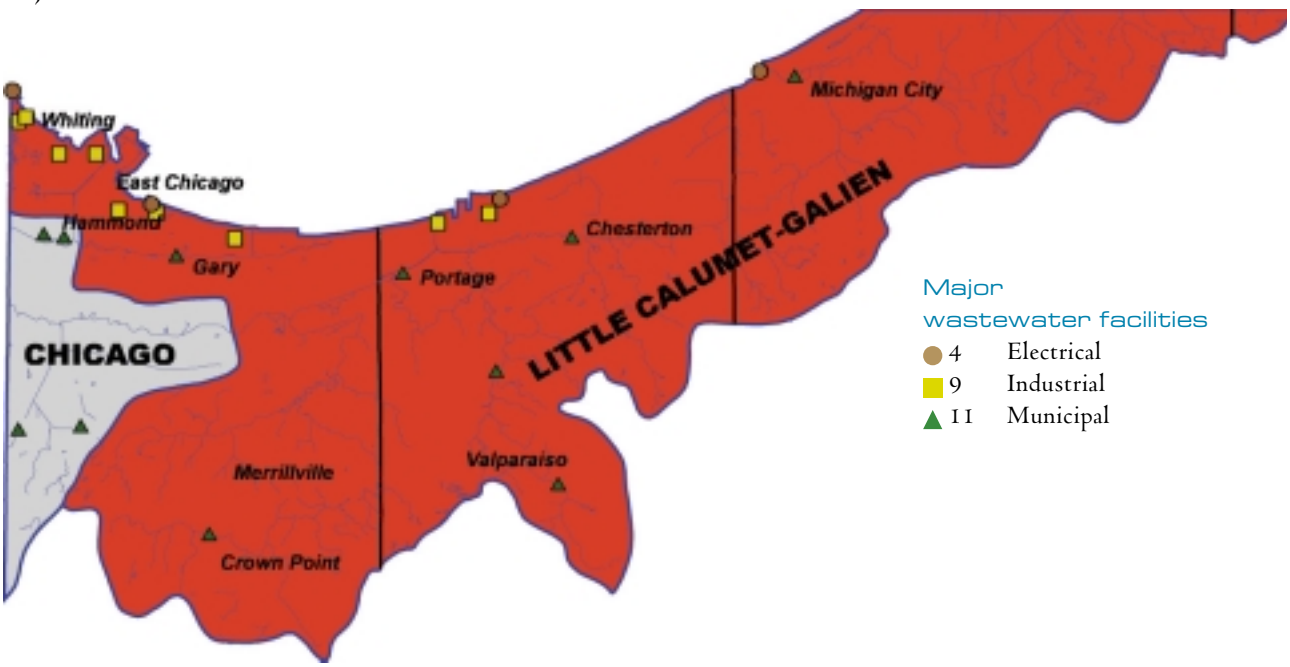
Note on Overall Basin Quality—Overall basin quality is determined by using data from the Unified Water Assessment of Indiana Watersheds, the Surface Water Quality Monitoring Strategy and other data sources. As a result, overall basin quality ratings may differ from the individual watershed ratings based upon surveyed stream miles. Changes in basin quality ratings from prior reports are due, in most part, to improved analysis and increased data availability.

Note on Aquatic Life Support—Watersheds Beginning with the 1998 Indiana Water Quality Report, surveyed watershed stream miles have been given an additional classification of partially supporting. Partially supporting water quality supports aquatic communities with fewer species of fish plants and aquatic insects. For this report, watershed stream miles rated partially supporting have been combined with those rated non-supporting.

Lake Michigan Basin

The basin is located in Northwest Indiana and drains portions of Lake, Porter and LaPorte counties. The drainage area within Indiana is approximately 400 square miles. The Grand Calumet River-Indiana Harbor Ship Canal, Trail Creek and Little Calumet River are the major tributaries in the basin.

IDEM has assessed the 43 miles of Lake Michigan shoreline for physical, chemical and biological information. Every mile fully supported aquatic life uses. However, the shoreline is rated as partially supporting recreational uses due to periodic beach closings caused by elevated levels of *E. coli* bacteria.



Overall basin quality

Aquatic life support
(26% of total stream miles assessed for aquatic life support)

Recreational uses
(25% of total stream miles assessed for recreational use)

Watersheds

Watershed	Stream miles	% Surveyed	Aquatic life support	% Surveyed	Recreational support
Lake Michigan*	43	100%	100% / 0%	100%	0% / 100%
L.Calumet-Galien	574	22%	34% / 66%	22%	46% / 54%
Chicago	40	10%	0% / 100%	0%	Insufficient info.

**All 43 miles of Lake Michigan shoreline are partially supporting for recreation .*

Source: 1996 Indiana Water Quality Report

St. Joseph River Basin

The basin is located in northern Indiana and drains portions of Elkhart, Kosciusko, LaGrange, Noble, St. Joseph and Steuben counties. The drainage area within Indiana is approximately 1,800 square miles. The St. Joseph, Elkhart and Little Elkhart rivers and Turkey and Pigeon creeks are the major tributaries in the basin.

Major wastewater facilities

1 Industrial

8 Municipal

Overall basin quality

Aquatic life support

(7% of total stream miles assessed for aquatic life support)

Recreational uses

(7% of total stream miles assessed for recreational use)

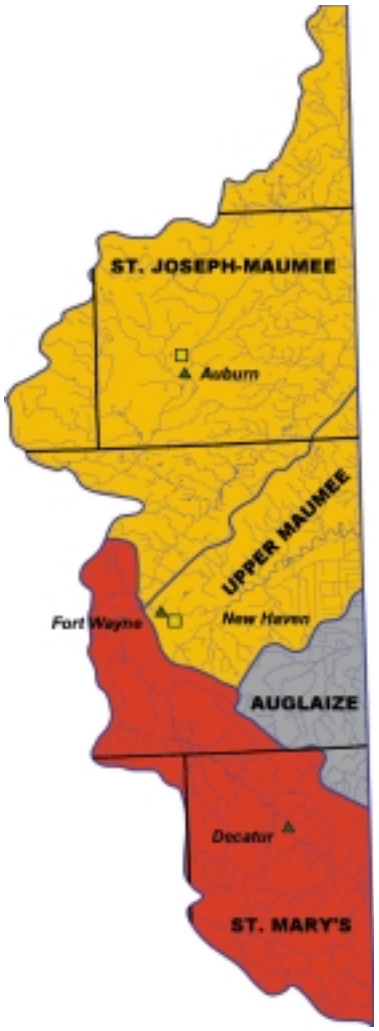
Watersheds

Watershed	Stream miles	Aquatic life support % Surveyed	Recreational support % Surveyed
St. Joseph	1350	7%	7%

Source: 1996 Indiana Water Quality Report

Maumee River Basin

The basin is located in northeastern Indiana and drains portions of Adams, Allen, DeKalb, Noble, Steuben and Wells counties. The drainage area within Indiana is approximately 1,200 square miles. The Maumee, St. Joseph and St. Mary's rivers are the major tributaries in the basin.



Major wastewater facilities

- 5 Industrial
- 3 Municipal

Overall basin quality

Aquatic life support
(11% of total stream miles assessed for aquatic life support)

71% | 29%

Recreational uses
(11% of total stream miles assessed for recreational use)

81% | 19%

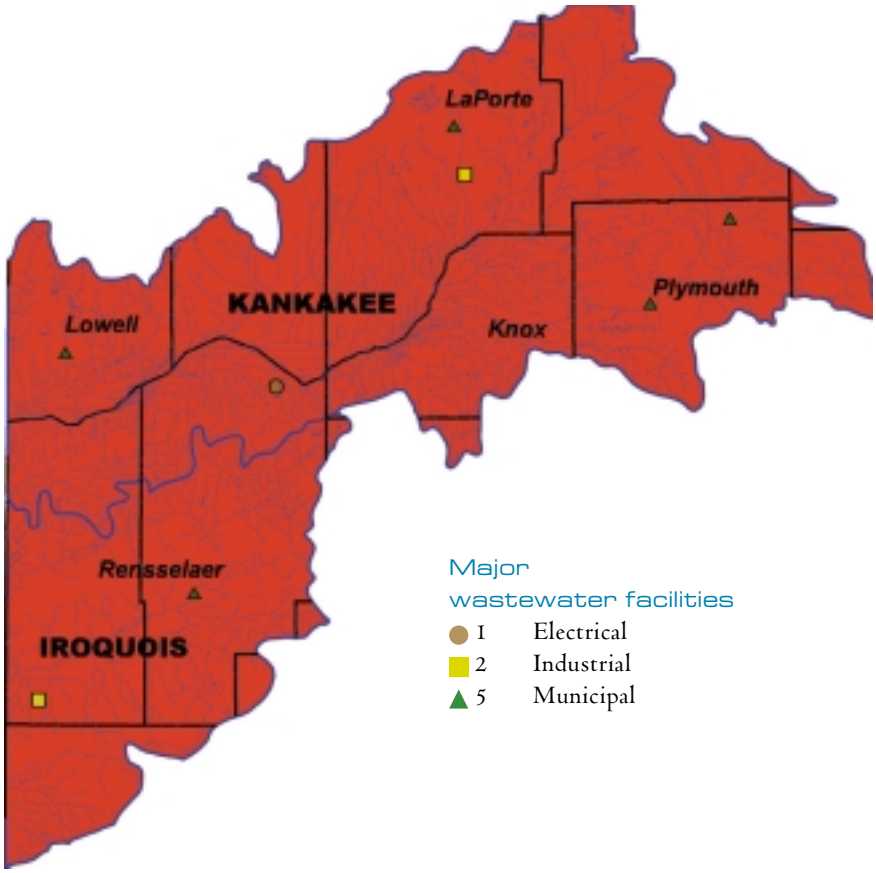
Watersheds

Watershed	Stream miles	% Surveyed	Aquatic life support	% Surveyed	Recreational support
St. Joseph-Maumee	678	11%	84% / 16%	11%	59% / 41%
Upper Maumee	292	15%	100% / 0%	15%	100% / 0%
St. Mary's	337	11%	11% / 89%	11%	100% / 0%
Auglaize	117	0%	Insufficient info.	0%	Insufficient info.

Source: 1996 Indiana Water Quality Report

Kankakee River Basin

The basin is located in northwestern Indiana and drains portions of Lake, Jasper, LaPorte, Marshall, Newton, Porter, Starke, and St. Joseph counties. The drainage area within Indiana is approximately 3,000 square miles. The Kankakee, Iroquois and Yellow rivers are the major tributaries in the basin.



Overall basin quality

Aquatic life support
(3% of total stream miles assessed for aquatic life support)

Recreational uses
(3% of total stream miles assessed for recreational use)

Watersheds

Watershed	Stream miles	Aquatic life support % Surveyed	Aquatic life support	Recreational support % Surveyed	Recreational support
Kankakee	2646	3%	64% / 36%	3%	44% / 56%
Iroquois	857	<1%	100% / 0%	0%	Insufficient info.

Source: 1996 Indiana Water Quality Report

Upper Wabash River Basin

The basin drains portions of 25 counties, including Fulton, Grant, Pulaski, Tippecanoe, Wabash, and White. The drainage area within Indiana is approximately 6,900 square miles. Wildcat Creek and the Wabash, Tippecanoe, Eel and Salamonie rivers are the major tributaries in the basin.

Major wastewater facilities

- 4 Electrical
- 1 Government
- 4 Industrial
- 18 Municipal

Overall basin quality

Aquatic life support*
(100% of total stream miles assessed for aquatic life support)

75% | 25%

Recreational uses
(18% of total stream miles assessed for recreational use)

37% | 63%

Watersheds

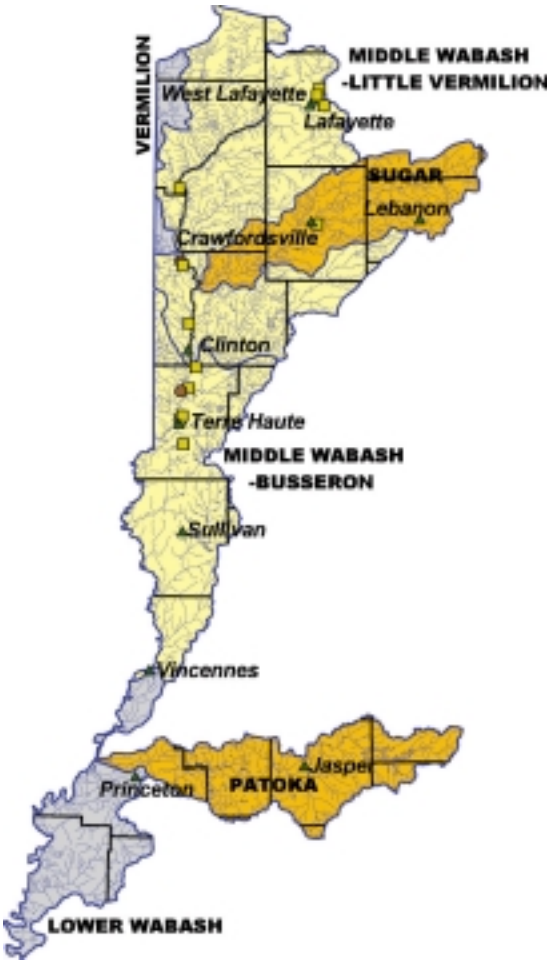
Watershed	Stream miles	% Surveyed	Aquatic life support		% Surveyed	Recreational support	
Eel-Wabash**	747	22%	67%	33%	10%	0%	100%
Upper Wabash**	953	21%	53%	47%	7%	0%	100%
Salamonie**	364	21%	85%	15%	9%	0%	100%
Mississinewa**	496	25%	70%	30%	5%	0%	100%
Tippecanoe**	2162	19%	89%	11%	10%	16%	84%
M. Wabash-Deer**	618	24%	100%	0%	14%	0%	100%
Wildcat**	689	87%	82%	18%	85%	63%	37%

**Overall Basin Quality based upon statistically designed sampling methodology.*
***Contains partially supporting waters for aquatic life.*

Source: 2000 Indiana Water Quality Report

Lower Wabash River Basin

The basin drains portions of 19 counties, including Montgomery, Clinton, Fountain and Vigo. The drainage area within Indiana is approximately 7,200 square miles. The Wabash, Patoka and Little Vermilion rivers and Sugar and Busseron creeks are the major tributaries in the basin.



Major wastewater facilities

- 2 Electrical
- 12 Industrial
- 10 Municipal

Overall basin quality

Aquatic life support
(23% of total stream miles assessed for aquatic life support)

87% 13%

Recreational uses
(4% of total stream miles assessed for recreational use)

100% 0%

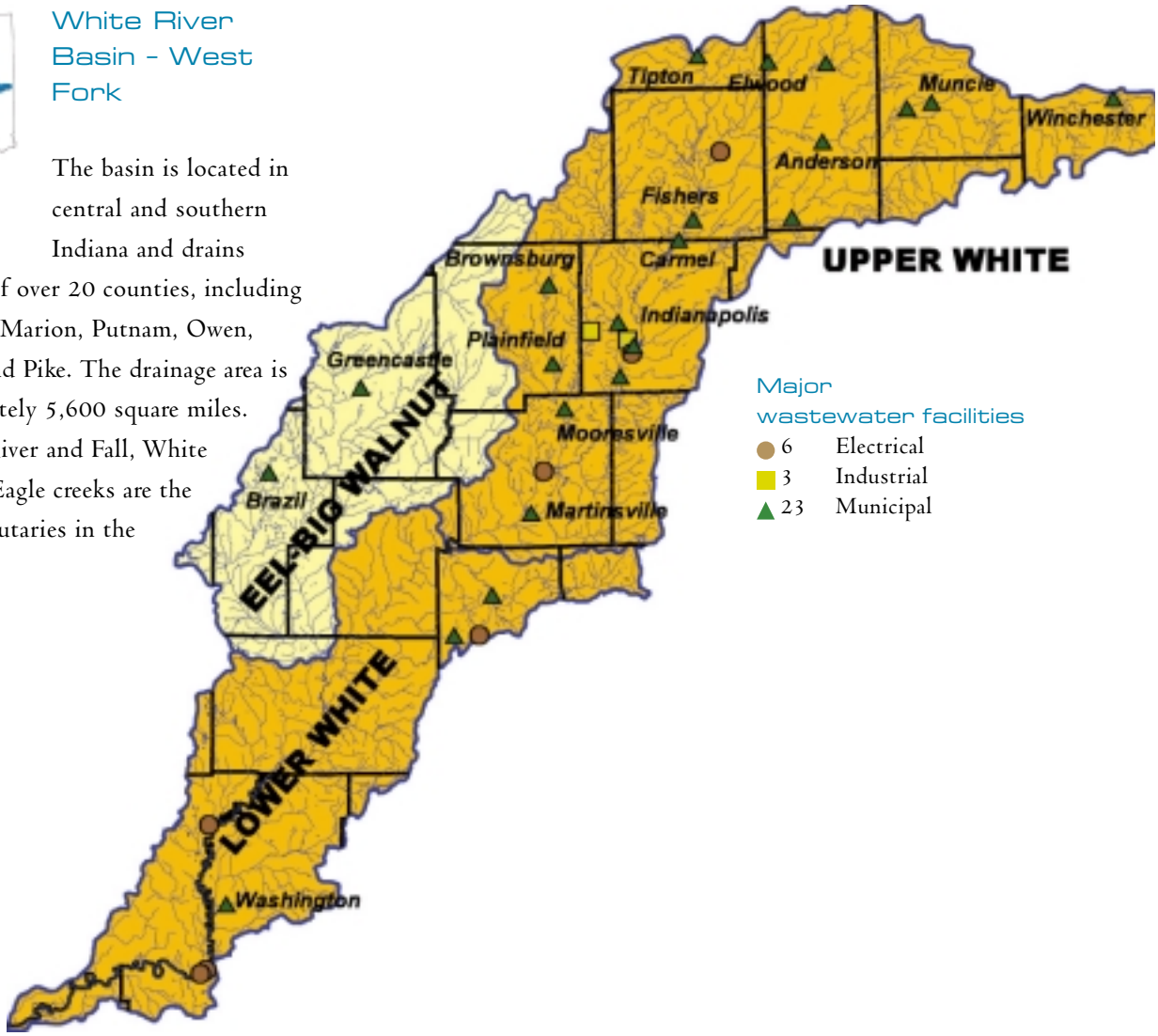
Watersheds

Watershed	Stream miles	% Surveyed	Aquatic life support	Recreational support % Surveyed	Recreational support
Sugar*	840	11%	100% 0%	0%	Insufficient info.
Patoka**	657	100%	94% 6%	30%	100% 0%
Vermilion*	134	15%	100% 0%	0%	Insufficient info.
Lower Wabash*	957	0%	Insufficient info.	0%	Insufficient info.
Middle Wabash					
L.Vermilion*	2298	8%	56% 44%	0%	Insufficient info.
Busseron*	795	13%	84% 16%	0%	Insufficient info.

*Source: *1996 Indiana Water Quality Report and **1998 Indiana Water Quality Report*

White River Basin - West Fork

The basin is located in central and southern Indiana and drains portions of over 20 counties, including Delaware, Marion, Putnam, Owen, Daviess and Pike. The drainage area is approximately 5,600 square miles. The Eel River and Fall, White Lick and Eagle creeks are the major tributaries in the basin.



Overall basin quality

Aquatic life support
(100% of total stream miles assessed for aquatic life support)

Recreational uses
(77% of total stream miles assessed for recreational use)

Watersheds

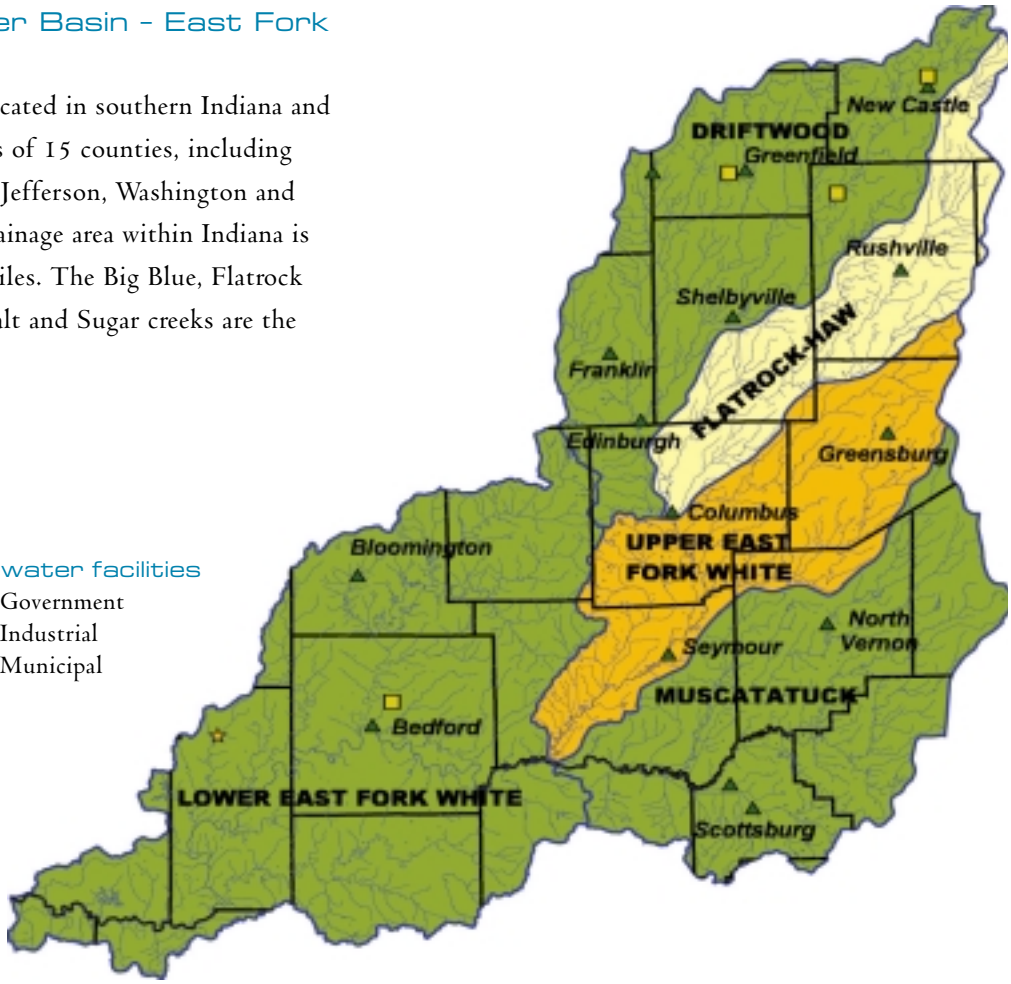
Watershed	Stream miles	Aquatic life support % Surveyed	Aquatic life support	Recreational support % Surveyed	Recreational support
Upper White*	1755	100%	68% / 32%	83%	88% / 12%
Eel-Big Walnut*	1132	100%	81% / 19%	65%	54% / 46%
Lower White*	794	100%	93% / 7%	77%	86% / 14%

**Contains partially supporting waters for aquatic life*

Source: 1998 Indiana Water Quality Report

White River Basin - East Fork

The basin is located in southern Indiana and drains portions of 15 counties, including Henry, Ripley, Jefferson, Washington and Brown. The drainage area within Indiana is approximately 5,600 square miles. The Big Blue, Flatrock and Muscatatuck rivers and Salt and Sugar creeks are the major tributaries of the basin.



Major wastewater facilities

- ★ 1 Government
- ■ 4 Industrial
- ▲ 15 Municipal

Overall basin quality

Aquatic life support
(100% of total stream miles assessed for aquatic life support)

70% | 30%

Recreational uses
(48% of total stream miles assessed for recreational use)

60% | 40%

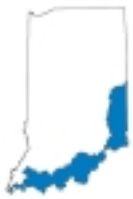
Watersheds

Watershed	Stream miles	% Surveyed	Aquatic life support		% Surveyed	Recreational support	
Driftwood	836	91%	90%	10%	72%	47%	53%
Flatrock-Haw	458	100%	100%	0%	18%	60%	40%
Upper E. Fork White	679	100%	99%	<1%	25%	52%	48%
Lower E. Fork White**	1545	88%	>99%	<1%	46%	78%	22%
Muscatatuck**	916	80%	>99%	<1%	60%	53%	47%

**Overall Basin Quality based upon statistically designed sampling methodology.*

***Contains partially supporting waters for aquatic life*

Source: 2000 Indiana Water Quality Report

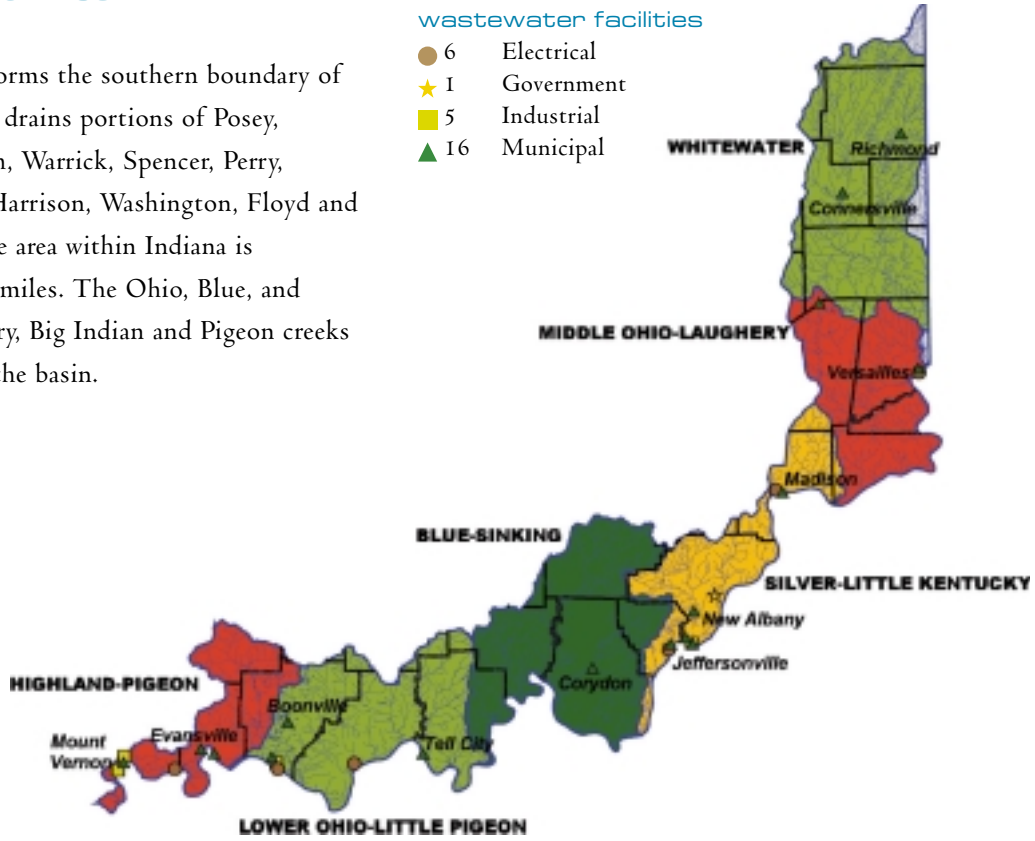


Ohio River Basin

The basin forms the southern boundary of Indiana and drains portions of Posey, Vanderburgh, Warrick, Spencer, Perry, Crawford, Harrison, Washington, Floyd and Clark counties. The drainage area within Indiana is approximately 5,800 square miles. The Ohio, Blue, and Anderson rivers and Laughery, Big Indian and Pigeon creeks are the major tributaries in the basin.

Major wastewater facilities

- 6 Electrical
- 1 Government
- 5 Industrial
- 16 Municipal



Overall basin quality

Aquatic life support
(36% of total stream miles assessed for aquatic life support)

87% | 13%

Recreational uses
(11% of total stream miles assessed for recreational use)

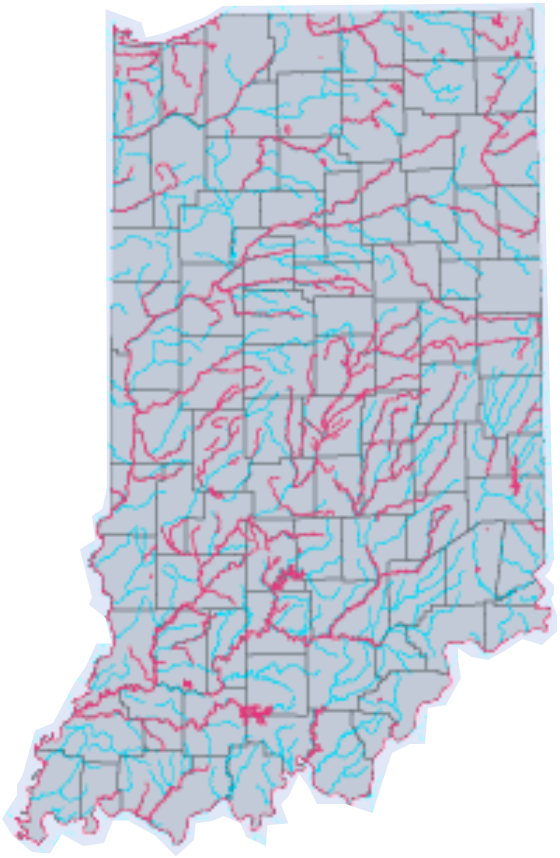
31% | 69%

Watersheds

Watershed	Stream miles	% Surveyed	Aquatic life support	% Surveyed	Recreational support
Whitewater**	1132	100%	92% / 8%	13%	97% / 3%
Ohio River-Mainsteam*	357	100%	76% / 24%	100%	0% / 100%
M. Ohio-Laughery*	719	0%	Insufficient info.	0%	Insufficient info.
Silver-L. Kentucky*	549	0%	Insufficient info.	0%	Insufficient info.
Blue-Sinking*	862	9%	100% / 0%	0%	Insufficient info.
Lower Ohio-L. Pigeon*	773	<1%	0% / 100%	0%	Insufficient info.
Highland-Pigeon*	389	11%	0% / 100%	0%	Insufficient info.

*Source: *1996 Indiana Water Quality Report and **2000 Indiana Water Quality Report*

Indiana's impaired rivers and lakes

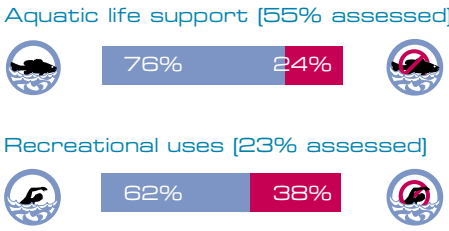


Indiana's impaired rivers and lakes

The map shows Indiana's impaired rivers and lakes. In accordance with the Surface Water Monitoring Strategy, IDEM performs sampling, analysis and assessment of each basin once every five years. The impaired rivers and lakes do not meet Indiana's water quality standards for designated uses or other natural resource goals, such as aquatic life support, fish consumption and recreational use.

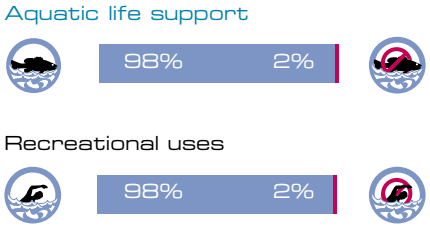
Indiana's rivers and streams

As of 1999, IDEM has assessed more than 55 percent of the state's total stream miles for the water's ability to support fish, shellfish and other aquatic life. Seventy-six percent of those stream miles were found to be supportive of aquatic life. Of the 23 percent of stream miles surveyed for recreational use, more than one-third were determined unsafe for swimming due to frequent high levels of *E. coli* bacteria.



Indiana's lakes

IDEM has assessed nearly every acre of Indiana's lakes and reservoirs for their ability to support swimming and aquatic life. All Indiana lakes are designated for full body contact use and full aquatic life support. Nearly all lakes and reservoirs support their designated uses.



Source: 2000 Indiana Water Quality Report

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